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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Marcus May — **Examiner**: Guiterrez, Anthony
Serial No: 10/603,640 — **Art Group**: 2857
Filing Date: 6/25/03 — **Docket No**: SIG000085
Title: METHOD AND APPARATUS FOR EFFICIENT BATTERY USE BY A HANDHELD MULTIPLE FUNCTION DEVICE

Date: 4/27/06

Honorable Commissioner of
Patents and Trademarks,
Alexandria, Virginia 22313

APPELANT'S BRIEF

In response to the Notification of Non-Compliant Appeal Brief mailed on 4/14/06, the applicant is resubmitting the Appeal Brief with the appropriate corrections.

1. On February 17, 2006, the applicant filed a Notice of Appeal and a Pre-Appeal Brief Request for Review. A Notice of Panel Decision from Pre-Appeal Brief Review was mailed on March 14, 2006. Accordingly, the present Appellant's brief is being filed prior to April 17, 2006.

2. The $500.00 fee for filing the Appellant Brief has already been paid.

CERTIFICATE OF MAILING
37 C.F.R 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner of Patents and Trademarks, Alexandria, Virginia 22313, on the date below:

04/27/2006 — Diane Hudson

Date — Signature

3. Real Party in Interest:

The inventors, Marcus W. May, Daniel Mulligan, and Matthew B. Henson, all of Austin, Texas, have assigned the entire rights, title and interest in and to the invention of the present patent application to SigmaTel, Inc.

4. Related Appeals and Interferences:

The appellant, the Assignee, and the undersigned are not aware of any related Appeals, Interferences, or judicial proceedings that would affect or have a bearing on the Board's decision in the pending appeal.

5. Status of Claims:

The present patent application includes claims 1 – 30 all of which currently stand rejected. The appellant is requesting the Board of Appeals to review the rejection of all 30 claims.

6. Status of Amendments:

There have been no amendments filed subsequent to the close of prosecution.

7. Summary of the Claimed Subject Matter:

Claim 1 claims a method for efficient battery use by a handheld multiple function device that includes monitoring at least one output for an overload condition (e.g., with reference to Figure 5, monitoring the headphone jack 52 for an overload condition, which may be caused by a short circuit as disclosed in paragraph 54). The method further includes monitoring a system voltage produced by a DC-to-DC converter for a system low voltage condition (e.g., with reference to Figure 5 and paragraph 55, monitoring for a drop in voltage of an output voltage of the DC-to-DC converter by certain percentage). The method further includes monitoring voltage of the battery for a battery low voltage condition (e.g., with reference to Figure 5 and paragraph 57, monitoring the battery voltage for it to drop below a certain threshold).

The method further includes enabling one of a plurality of fail safe algorithms based on when one or more of the overload condition, the system low voltage condition, and the battery low voltage condition are detected. For example, when this condition (i.e., battery low voltage condition) is detected, the processing module stores essential settings corresponding to the execution of a functional algorithm being performed and shuts down the device. In this manner, the algorithm is terminated in a predictable manner, as opposed to crashing the algorithm, thus, when the device is restarted, the algorithm can be predictably be restarted. (See paragraph 57).

As another example, when a low system voltage condition arises, it is indicative that the amount of power being consumed by the handheld device is beyond the remaining power capacity of the battery 14 but is not causing dangerously low output voltages to be generated, which might result in an unsafe shutdown of the handheld device. In this instance, the processing module may disable one or more of the outputs of the handheld device, store the current settings of operation of the handheld device (e.g., volume setting, which particular song is being played from an MP3 storage file, bass settings, treble settings, et cetera). Once these settings have been stored, the handheld device is shutdown such that when the battery is replaced and the handheld device is reactivated, the operation continues where it left off. Alternatively, the processing module may shutdown only a portion of the handheld device. For example, the processing module for the low system voltage condition may shutdown the headphone jack which is a primary consumer of power for the handheld device but still allow for data file transfers and/or other low power consuming activities. (See paragraph 56)

As yet another example, if the headphones were faulty such that they cause a short within the headphone jack 52, an overload condition would result. When an overload condition results, the processing module 20 disables the output for a predetermined period of time (e.g., one second to ten seconds). When the predetermined period of time expires, the processing module 20 enables the output again and resumes monitoring for an overload condition. If the overload condition persists, the output is

again disabled. The disabling and enabling of the output may be done by a switch mechanism and/or by placing an output driver at a high impedance state to disable, for this example, the headphone jack 52. If the overload condition persists after several retries, the processing module 20 may cease to continue the retry and generate an error message for display on the handheld device indicating that the particular output is experiencing an overload condition.

Claim 8 claims a method for efficient battery use by a handheld multiple function device that includes monitoring at least one output for an overload condition. The method further includes monitoring voltage of the battery for a battery low voltage condition, or system voltage produced by a DC-to-DC converter for a system low voltage condition. The method further includes enabling one of a plurality of fail safe algorithms based on when one or more of the overload condition, the system low voltage condition, and the battery low voltage condition are detected.

The method of claim 8 includes similar limitations as the method of claim 1 with the exception that, in claim 8, a battery voltage or a system voltage is monitored as opposed to both being monitored as in claim 1.

Claim 12 claims a method for efficient battery use by a handheld multiple function device that includes monitoring voltage of the battery for a battery low voltage condition. The method further includes monitoring a system voltage produced by a DC-to-DC converter for a system low voltage condition. The method further includes enabling one of a plurality of fail safe algorithms based on when one or more of the system low voltage condition and the battery low voltage condition are detected.

Claim 12 includes similar limitations as the method of claim 1 with the exception that claim 12 does not include the step of monitoring for an overload condition and enabling one of the plurality of fail safe algorithms when an overload condition is detected.

Claim 16 claims an apparatus for efficient battery use by a handheld multiple function device that includes a processing module and memory. (See figures 1-5). The memory includes operational instructions that cause the processing module to: monitor at least one output for an overload condition; monitor a system voltage produced by a DC-to-DC converter for a system low voltage condition; monitor voltage of the battery for a battery low voltage condition; and enable one of a plurality of fail safe algorithms based on when one or more of the overload condition, the system low voltage condition, and the battery low voltage condition are detected.

As claimed, claim 16 provides an apparatus that performs the method of claim 1.

Claim 23 claims an apparatus for efficient battery use by a handheld multiple function device that include a processing module and memory. The memory stores operational instructions that cause the processing module to: monitor at least one output for an overload condition; monitor at least one of: voltage of the battery for a battery low voltage condition, and system voltage produced by a DC-to-DC converter for a system low voltage condition; and enable one of a plurality of fail safe algorithms based on when one or more of the overload condition, the system low voltage condition, and the battery low voltage condition are detected.

As claimed, claim 23 provides an apparatus that performs the method of claim 8.

Claim 27 claims an apparatus for efficient battery use by a handheld multiple function device that includes a processing module and memory. The memory stores operational instructions that cause the processing module to: monitor voltage of the battery for a battery low voltage condition; monitor a system voltage produced by a DC-to-DC converter for a system low voltage condition; and enable one of a plurality of fail safe algorithms based on when one or more of the system low voltage condition and the battery low voltage condition are detected.

As claimed, claim 27 provides an apparatus that performs the method of claim 12.

8. Issues to be Reviewed on Appeal:

A. Claims 1, 5-7, 8, 11, 12, 14-16, 20-23, 26, 27, 29, and 30 have been rejected under 35 USC § 103 (a) as being unpatentable over Urbano (U.S. Patent No. 6,592,521) in view of Choudhury (U.S. Patent No. 6,169,669).

B. Claims 2, 9, 17, and 24 have been rejected under 35 USC § 103 (a) as being unpatentable over Urbano (U.S. Patent No. 6,592,521) in view of Choudhury (U.S. Patent No. 6,169,669) and in further view of Barker (U.S. Patent No. 3,609,504).

C. Claims 3, 4, 10, 13, 18, 19, 25 and 28 have been rejected under 35 USC § 103 (a) as being unpatentable over Urbano (U.S. Patent No. 6,592,521) in view of Choudhury (U.S. Patent No. 6,169,669) in further view of Patel (U.S. Patent No. 5,018,148).

9. Argument:

A. Claims 1, 5-7, 8, 11, 12, 14-16, 20-23, 26, 27, 29, and 30 have been rejected under 35 USC § 103 (a) as being unpatentable over Urbano (U.S. Patent No. 6,592,521) in view of Choudhury (U.S. Patent No. 6,169,669). All of these claims will be argued as a group.

Urbano does not teach efficient use of a battery in a handheld device to initiate one of a plurality of fail safe algorithms based on when one or more of the overload condition, the system low voltage condition, and the battery low voltage condition are detected. Urbano, however, does teach an ultrasound system that includes techniques to reduce power consumption. For instance, Urbano teaches that power consumption by electrical components is reduced in one or both of the ultrasound data path and the ultrasound processing control. (column 3, lines 12 – 15) Urbano further teaches, at column 5, lines 1 – 9 that:

> In one embodiment for reducing power consumption, one or more electrical components in one or more of the subsystems of the ultrasound system 10 operate in a reduced power mode. During use, the electrical component operates in a full power mode or an increased power state. During a non-use period, the electrical component may be controlled to operate in a low power mode or a decreased power state. For example, a digital electrical component is placed into a sleep state for low power consumption.

Urbano further teaches that, during the non-use periods, the low power mode or decreased power state may achieved in a variety of ways. For example, at column 5, lines 47 – 50, Urbano discloses at reduced clock rate:

> When the electrical component 40 is not being used, the control 44 controls the output of the clock to halt or reduce the toggling rate, reducing consumption of power by the electrical component 40.

At column 5, lines 62 – 66, Urbano discloses a standby mode or suspend mode:

> instruction or external signal. In these embodiments, the control path comprises a controller for generating the external suspend or standby signal. Alternatively, the electrical component includes a time-based or other internal instruction for automatically entering a suspend or standby mode during periods of nonusage. As an alternative or in addition

At column 6, lines 5 – 21, Urbano discloses a return to initialization state:

> electrical components. For example, a field programmable gate array, such as a random access memory based field programmable gate array, has an initial unprogrammed state for receiving instructions and then operates in a programmed state during the processing of data using the programmed instructions. Power consumption is less in the initial unprogrammed state. To enter a low-power mode or decreased power state, the field programmable gate array is placed into the unprogrammed state. For example, an Altera Flex 10 K field programmable gate array device is forced into an unprogrammed state by asserting a "configuration" input without loading any programming data. For processing and operating in a full power mode, program data is loaded into the field programmable gate array. Other devices that use less power during an initialization stage or other state may be operated in a similar manner for decreased power consumption. Additionally or alternatively, a clock frequency asso-

At column 6, lines 28 – 31, Urbano discloses a reduced power supply state:

> low power mode or decreased power state. For example, a voltage supplied to an analog component, such as an analog amplifier, is reduced. A voltage regulator may include a control for reducing the output voltage. As another example,

Urbano further teaches that the various lower power states may be initiated in a variety of ways. For example, Urbano discloses that a user activated button (column 7, lines 4 – 6), expiration of an inactivity time out period (column 7, lines 14 – 17), expiration of a wait to receive input time period (column 7, lines 20 – 22), and a user configuration (column 7, lines 33 – 36).

Accordingly, Urbano teaches an ultrasound system that has power reduction techniques to place un-used components into low power states that may be initiated in variety of ways. Urbano does not teach or suggest sensing for one or more of low battery, overload, or system low voltage and initiating a fail safe algorithm in response thereto.

Choudhury teaches a digital signal processor controlled uninterruptible power supply (UPS), where the basic architecture of the UPS is shown in Figure 2 and the DSP

of Figure 3 produces the pulse width modulated (PWM) control signals for transistors 211, 213, 241, 251, 231, and 233 of Figure 2. The UPS has two modes of operation: a normal mode and a battery back up mode. In the normal mode, the UPS produces an AC output and charges the battery. In the battery back up mode, the UPS converts the battery voltage to a DC bus voltage and, via a DC-AC inverter, produces the AC output from the DC bus voltage. (column 3, lines 28 – 44)

Choudhury teaches that the DSP produces the PWM control signals PWM1 – PWM6 (column 4, lines 45 – 49) by performing the functions of Figures 5 – 13. In Figure 10 and the corresponding text at column 8, lines 22 – 57, the DSP produces PWM5 and PWM6 signals for transistors 231 and 233 such that the DC/AC inverter portion of the UPS is regulated. The PWM5 and PWM6 signals are produced by comparing a digitized output voltage (Vout) with a reference sinusoid waveform (Vref) to produce a difference. The difference is processed by a compensator (P11) to produce a reference current for an inner current loop. In addition, a digitized inductor current feedback (Iout) is compared with the output of the first compensator (P11) to produce a second difference. A second compensator (P12) produces PWM5 and PWM6 signals from the second difference.

In Figure 11 and the corresponding text of column 8, line 58, through column 9, line 25, Choudhury teaches that the DSP generates a PWM3 signal and disable a PWM4 signal for charging the 110 volt DC battery 105 from the 400 volt DC bus. In this mode, the DSP senses the battery current (Ib), the battery voltage (Vb), and V- with respect to ground. The battery voltage and battery current are used to determine which of the three battery charge modes (e.g., trickle, bulk charge, and over charge) to initiate.

In Figure 12 and the corresponding text of column 9, line 26, through column 10, line 11, Choudhury teaches that the DSP generates PWM1 and PWM2 signals to regulate the DC bus to 400 volts DC. To do this, the DSP senses the AC input voltage (Vs), the AC input current (Is), and the DC bus voltage (V-, V+). Based on these inputs, the pulse width of PWM1 and PWM2 signals is determined such that the DC bus is regulated to 400 volts.

In Figure 13 and the corresponding text of column 10, lines 12 – 35, Choudhury teaches that the DSP generates PWM4 signal and disables PWM3 signal to produce a boost converter for the battery back up mode. In this mode, the DSP senses the battery current (Ib), the battery voltage (Vb), and V- with respect to ground to establish the pulse width of the PWM4 signal.

From the above passages, Choudhury teaches a UPS that has a DSP producing the control signals for the normal mode and the battery back up mode of the UPS. Choudhury does not teach of suggest sensing for one or more of low battery, overload, or system low voltage and initiating a fail safe algorithm in response thereto.

Since each of the independent claims 1, 8, 12, 16, 23, and 27 of the present patent application includes a limitation for sensing at least one of a low battery condition, an overload condition, or a system low voltage condition and initiating a fail safe algorithm in response thereto, the applicant believes that the combination of Urbano with Choudhury fails to render the present claims obvious. In particular, the power reduction techniques of Urbano in combination with the normal and battery back up modes of generating PWM signals of Choudhury do not suggest a method and apparatus for initiating a fail safe algorithm in response to sensing a low battery condition, an overload condition, and/or a low system supply voltage condition.

B. Claims 2, 9, 17, and 24 have been rejected under 35 USC § 103 (a) as being unpatentable over Urbano (U.S. Patent No. 6,592,521) in view of Choudhury (U.S. Patent No. 6,169,669) and in further view of Barker (U.S. Patent No. 3,609,504). All of these claims will be argued as a group.

As demonstrated above, the combination of Urbano and Choudhury fail to render the independent claims of the present patent application obvious. Thus, the applicant

believes that the present claims, which are dependent on such independent claims, are not obvious in view of the cited prior art.

C. Claims 3, 4, 10, 13, 18, 19, 25 and 28 have been rejected under 35 USC § 103 (a) as being unpatentable over Urbano (U.S. Patent No. 6,592,521) in view of Choudhury (U.S. Patent No. 6,169,669) in further view of Patel (U.S. Patent No. 5,018,148). All of these claims will be argued as a group.

As demonstrated above, the combination of Urbano and Choudhury fail to render the independent claims of the present patent application obvious. Thus, the applicant believes that the present claims, which are dependent on such independent claims, are not obvious in view of the cited prior art.

Based on the foregoing arguments, the applicant respectfully requests that the Board of Appeals pass claims 1-30 to allowance.

RESPECTFULLY SUBMITTED,

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Claim Appendix:

1. (original) A method for efficient battery use by a handheld multiple function device, the method comprises:

monitoring at least one output for an overload condition;

monitoring a system voltage produced by a DC-to-DC converter for a system low voltage condition;

monitoring voltage of the battery for a battery low voltage condition; and

enabling one of a plurality of fail safe algorithms based on when one or more of the overload condition, the system low voltage condition, and the battery low voltage condition are detected.

2. (original) The method of claim 1, wherein the enabling one of the plurality of fail safe algorithms further comprises:

when the overload condition is detected and when the system low voltage condition and the battery low voltage condition are not detected, enabling a first fail safe algorithm of the plurality of fail safe algorithms to:

> disable the at least one output for a predetermined period of time;
>
> after expiration of the predetermined period of time, enable the at least one output; and
>
> resume monitoring of the at least one output for the overload condition.

3. (original) The method of claim 1, wherein the enabling one of the plurality of fail safe algorithms further comprises:

when the system low voltage condition is detected and when the overload condition is not detected, enabling a second fail safe algorithm of the plurality of fail safe algorithms to:

disable the at least one output;

store current settings corresponding to execution of at least one functional algorithm; and

shutdown the handheld multiple function device.

4. (original) The method of claim 1, wherein the enabling one of the plurality of fail safe algorithms further comprises:

when the battery low voltage condition is detected, enabling a third fail safe algorithm of the plurality of fail safe algorithms to:

store essential current settings corresponding to execution of at least one functional algorithm; and

shut down the handheld multiple function device.

5. (original) The method of claim 1, wherein the monitoring the at least one output for the overload condition further comprises:

determining output current provided to the at least one output; and

when the output current exceeds a current threshold, identifying the overload condition.

6. (original) The method of claim 1, wherein the monitoring a system voltage produced by the DC-to-DC converter for a system low voltage condition further comprises:

determining loading on an output of the DC-to-DC converter that is providing the system voltage;

determining available power duration based on the loading and the voltage of the battery; and

when the available power duration is less than a power available threshold, indicating the system low voltage condition.

7. (original) The method of claim 1, wherein the enabling one of the plurality of fail safe algorithms further comprises:

when the system low voltage condition is detected and when the overload condition is not detected, enabling a second fail safe algorithm of the plurality of fail safe algorithms to:

disable a portion of the handheld multiple function device;

store current settings corresponding to execution of at least one functional algorithm processed by the portion of the handheld multiple function device; and

continuing operation of the handheld multiple function device in a limited, low power consumption mode.

8. (original) A method for efficient battery use by a handheld multiple function device, the method comprises:

monitoring at least one output for an overload condition;

monitoring:

voltage of the battery for a battery low voltage condition, or

system voltage produced by a DC-to-DC converter for a system low voltage condition; and

enabling one of a plurality of fail safe algorithms based on when one or more of the overload condition, the system low voltage condition, and the battery low voltage condition are detected.

9. (original) The method of claim 8, wherein the enabling one of the plurality of fail safe algorithms further comprises:

when the overload condition is detected and when the system low voltage condition and the battery low voltage condition are not detected, enabling a first fail safe algorithm of the plurality of fail safe algorithms to:

disable the at least one output for a predetermined period of time;

after expiration of the predetermined period of time, enable the at least one output; and

resume monitoring of the at least one output for the overload condition.

10. (original) The method of claim 8, wherein the enabling one of the plurality of fail safe algorithms further comprises:

when the battery low voltage condition is detected, enabling a third fail safe algorithm of the plurality of fail safe algorithms to:

store essential current settings corresponding to execution of at least one functional algorithm; and

shutdown the handheld multiple function device.

11. (original) The method of claim 8, wherein the monitoring the at least one output for the overload condition further comprises:

determining output current provided to the at least one output; and

when the output current exceeds a current threshold, identifying the overload condition.

12. (original) A method for efficient battery use by a handheld multiple function device, the method comprises:

monitoring voltage of the battery for a battery low voltage condition;

monitoring a system voltage produced by a DC-to-DC converter for a system low voltage condition; and

enabling one of a plurality of fail safe algorithms based on when one or more of the system low voltage condition and the battery low voltage condition are detected.

13. (original) The method of claim 12, wherein the enabling one of the plurality of fail safe algorithms further comprises:

when the system low voltage condition is detected and when the overload condition is not detected, enabling a second fail safe algorithm of the plurality of fail safe algorithms to:

> disable the at least one output;
>
> store current settings corresponding to execution of at least one functional algorithm; and
>
> shutdown the handheld multiple function device.

14. (original) The method of claim 12, wherein the monitoring a system voltage produced by the DC-to-DC converter for a system low voltage condition further comprises:

determining loading on an output of the DC-to-DC converter that is providing the system voltage;

determining available power duration based on the loading and the voltage of the battery; and

when the available power duration is less than a power available threshold, indicating the system low voltage condition.

15. (original) The method of claim 12, wherein the enabling one of the plurality of fail safe algorithms further comprises:

when the system low voltage condition is detected and when the overload condition is not detected, enabling a second fail safe algorithm of the plurality of fail safe algorithms to:

> disable a portion of the handheld multiple function device;
>
> store current settings corresponding to execution of at least one functional algorithm processed by the portion of the handheld multiple function device; and

continuing operation of the handheld multiple function device in a limited, low power consumption mode.

16. (original) An apparatus for efficient battery use by a handheld multiple function device, the apparatus comprises:

processing module;

memory operably coupled to the processing module, wherein the memory includes operational instructions that cause the processing module to:

monitor at least one output for an overload condition;

monitor a system voltage produced by a DC-to-DC converter for a system low voltage condition;

monitor voltage of the battery for a battery low voltage condition; and

enable one of a plurality of fail safe algorithms based on when one or more of the overload condition, the system low voltage condition, and the battery low voltage condition are detected.

17. (original) The apparatus of claim 16, wherein the memory further comprises operational instructions that cause the processing module to enable one of the plurality of fail safe algorithms by:

when the overload condition is detected and when the system low voltage condition and the battery low voltage condition are not detected, enabling a first fail safe algorithm of the plurality of fail safe algorithms to:

disable the at least one output for a predetermined period of time;

after expiration of the predetermined period of time, enable the at least one output; and

resume monitoring of the at least one output for the overload condition.

18. (original) The apparatus of claim 16, wherein the memory further comprises operational instructions that cause the processing module to enable one of the plurality of fail safe algorithms by:

when the system low voltage condition is detected and when the overload condition is not detected, enabling a second fail safe algorithm of the plurality of fail safe algorithms to:

disable the at least one output;

store current settings corresponding to execution of at least one functional algorithm; and

shutdown the handheld multiple function device.

19. (original) The apparatus of claim 16, wherein the memory further comprises operational instructions that cause the processing module to enable one of the plurality of fail safe algorithms by:

when the battery low voltage condition is detected, enabling a third fail safe algorithm of the plurality of fail safe algorithms to:

store essential current settings corresponding to execution of at least one functional algorithm; and

shutdown the handheld multiple function device.

20. (original) The apparatus of claim 16, wherein the memory further comprises operational instructions that cause the processing module to monitor the at least one output for the overload condition by:

determining output current provided to the at least one output; and

when the output current exceeds a current threshold, identifying the overload condition.

21. (original) The apparatus of claim 16, wherein the memory further comprises operational instructions that cause the processing module to monitor a system voltage produced by the DC-to-DC converter for a system low voltage condition by:

determining loading on an output of the DC-to-DC converter that is providing the system voltage;

determining available power duration based on the loading and the voltage of the battery; and

when the available power duration is less than a power available threshold, indicating the system low voltage condition.

22. (original) The apparatus of claim 16, wherein the memory further comprises operational instructions that cause the processing module to enable one of the plurality of fail safe algorithms by:

when the system low voltage condition is detected and when the overload condition is not detected, enabling a second fail safe algorithm of the plurality of fail safe algorithms to:

disable a portion of the handheld multiple function device;

store current settings corresponding to execution of at least one functional algorithm processed by the portion of the handheld multiple function device; and

continuing operation of the handheld multiple function device in a limited, low power consumption mode.

23. (original) An apparatus for efficient battery use by a handheld multiple function device, the apparatus comprises:

processing module; and

memory operably coupled to the processing module, wherein the memory stores operational instructions that cause the processing module to:

monitor at least one output for an overload condition;

monitor at least one of:

voltage of the battery for a battery low voltage condition, and

system voltage produced by a DC-to-DC converter for a system low voltage condition; and

enable one of a plurality of fail safe algorithms based on when one or more of the overload condition, the system low voltage condition, and the battery low voltage condition are detected.

24. (original) The apparatus of claim 23, wherein the memory further comprises operational instructions that cause the processing module to enable one of the plurality of fail safe algorithms by:

when the overload condition is detected and when the system low voltage condition and the battery low voltage condition are not detected, enabling a first fail safe algorithm of the plurality of fail safe algorithms to:

disable the at least one output for a predetermined period of time;

after expiration of the predetermined period of time, enable the at least one output; and

resume monitoring of the at least one output for the overload condition.

25. (original) The apparatus of claim 23, wherein the memory further comprises operational instructions that cause the processing module to enable one of the plurality of fail safe algorithms by:

when the battery low voltage condition is detected, enabling a third fail safe algorithm of the plurality of fail safe algorithms to:

store essential current settings corresponding to execution of at least one functional algorithm; and

shut down the handheld multiple function device.

26. (original) The apparatus of claim 23, wherein the memory further comprises operational instructions that cause the processing module to monitor the at least one output for the overload condition further comprises:

determining output current provided to the at least one output; and

when the output current exceeds a current threshold, identifying the overload condition.

27. (original) An apparatus for efficient battery use by a handheld multiple function device, the apparatus comprises:

processing module; and

memory operably coupled to the processing module, wherein the memory stores operational instructions that cause the processing module to:

monitor voltage of the battery for a battery low voltage condition;

monitor a system voltage produced by a DC-to-DC converter for a system low voltage condition; and

enable one of a plurality of fail safe algorithms based on when one or more of the system low voltage condition and the battery low voltage condition are detected.

28. (original) The apparatus of claim 27, wherein the memory further comprises operational instructions that cause the processing module to enable one of the plurality of fail safe algorithms by:

when the system low voltage condition is detected and when the overload condition is not detected, enabling a second fail safe algorithm of the plurality of fail safe algorithms to:

disable the at least one output;

store current settings corresponding to execution of at least one functional algorithm; and

shutdown the handheld multiple function device.

29. (original) The apparatus of claim 27, wherein the memory further comprises operational instructions that cause the processing module to monitor a system voltage produced by the DC-to-DC converter for a system low voltage condition by:

determining loading on an output of the DC-to-DC converter that is providing the system voltage;

determining available power duration based on the loading and the voltage of the battery; and

when the available power duration is less than a power available threshold, indicating the system low voltage condition.

30. (original) The apparatus of claim 27, wherein the memory further comprises operational instructions that cause the processing module to enable one of the plurality of fail safe algorithms by:

when the system low voltage condition is detected and when the overload condition is not detected, enabling a second fail safe algorithm of the plurality of fail safe algorithms to:

disable a portion of the handheld multiple function device;

store current settings corresponding to execution of at least one functional algorithm processed by the portion of the handheld multiple function device; and

continuing operation of the handheld multiple function device in a limited, low power consumption mode.

Evidence Appendix:

No additional evidence is being submitted with this brief.

Related Proceedings Appendix:

There are no related proceedings.